

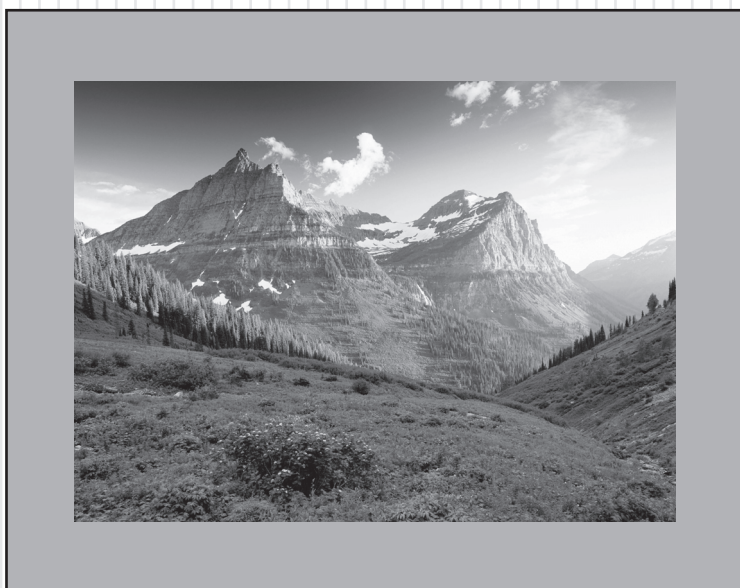
# *Montana* *Comprehensive Assessment* *System* (MontCAS, Phase 2 CRT)

Student Name:

School Name:

Teacher/Class:

GRADE 10  
COMMON RELEASED ITEMS  
SPRING 2008



**OPI**

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## **General Directions**

This test contains nine sessions: three in reading, three in mathematics, and three in science. The sessions are made up of multiple-choice questions and questions for which you must show your work or write out your answers. Write your answers to all of the questions in your Student Response Booklet. For the reading parts of the test, read each selection before answering the questions.

For each multiple-choice question, choose the best answer. Fill in the bubble in your Student Response Booklet that corresponds to your answer choice for that question.

Some questions ask you to show your work or to write out your answers. Write your answers to these questions in the spaces provided in your Student Response Booklet. Your answers must fit in the spaces provided. Any part of an answer outside the box might not be scored.

Be sure to answer all parts of each question, and to answer completely. For example, if a question asks you to explain your reasoning or show your work, be sure to do so. You can receive points for a partially correct answer, so try to answer every question.

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# Reading Session 1

No items released from this session in 2007/2008.

## Reading Session 2

**This test session includes reading selections and multiple-choice questions. After you read each selection, answer the questions about it in the spaces provided in your Student Response Booklet. You may not use a dictionary or any other reference tool during this session.**

*Read this article about taking great photographs. Then answer the questions that follow.*

### How to Photograph Your Family

*Benjamin Magro*

For the past thirty years, Benjamin Magro has specialized in aerial and landscape photography, but in recent years he's found himself doing more and more portraiture. The Appleton-based photographer has published widely—from *National Geographic Traveler* to *Better Homes and Gardens* to *Horticulture* magazine to the *New York Times Sunday Supplement*—and he's done a great deal of commercial photography.

1. I shoot both with film and with a digital camera, but more and more I'm using digital. It's just gotten to the point where it's finally arrived in terms of resolution and the equipment is good enough now that any old concerns I might have had are no longer valid. It creates a workflow that's faster because you're seeing what you're getting as you're shooting. All the technical considerations—what type of camera, what type of lens, what sort of focus, whether you use artificial light, take people in their environment or up close—what I call setup, all that stuff is in the way of what makes a picture good.

2. Getting people comfortable is the key part. Sometimes people never get comfortable, so they're kind of a moving target. What I find works is not to worry so much but to make a portrait where the person is very aware that they are having their portrait taken. Get everything set up and

then try to get them to move around and be themselves. Eventually you get to this point where you're rolling along and the process becomes more comfortable. Because the session goes on for an hour or an hour and a half, people will inevitably do something with their body language. I'll notice and say, "Let's try to do that again."



**“The biggest problem photographers have is that they don’t get close enough.”**

3. The biggest problem some photographers have is that they don't get close enough. People often have a fear—a very reasonable one—when they're trying to make a portrait that they are invading someone's personal space. You end up with a bunch of pictures of a person far away. I've done some shoots very close up. With one fellow who was older and not well, I realized that the photo was almost completely in his eyes, which were still bright and focused, and I ended up showing just a part of his face.



4. Lighting is everything—it’s really what creates the photo. Many cameras have a flash built in, and while using straight-on flash usually gets the picture and can be kind of fun and capricious, there are other ways of lighting your subject that don’t require fancy lighting setups. One of the best of these is simply using the diffused light that comes in through a window and letting it wash across your subject’s face. You could use a camera with a flash on top that goes pop and lights up the face flatly, with a lot of dark shadows behind the person. That can be kind of cool, and there’s often a serendipity to the photos. But if you are setting out to control the lighting with the goal of creating precise effects—setting up lightboxes—you have to have the necessary equipment and study lighting techniques.

5. Most people don’t take enough pictures. Once you get the lighting taken care of, try to get to the point where you are having fun and

getting a lot of different photographs. Then you’ll have something to select from that really represents the person or people you’re trying to photograph, that really captures emotion and says something about them.



**Taking photographs of your family—and getting your picture taken by your family—should be fun, and getting people comfortable is critical. Make your subject aware they’re getting their portrait taken, but let them move around and even pose.**

**Mark your answers in the section marked “Reading—Session 2” in your Student Response Booklet.**

28. In paragraph 1, the phrase “it’s finally arrived” means
- A. the author had just received his new digital camera.
  - B. digital cameras had recently been invented.
  - C. digital cameras can now produce high-quality photographs.
  - D. the author had taken photographs with a digital camera for the first time.

29. In paragraph 2, what is the best remedy for “moving targets”?
- A. encouraging the subjects to be themselves
  - B. shooting the photographs from very close up
  - C. telling the subjects to sit or stand in specific poses
  - D. taking the photographs when the subjects are not looking



30. In paragraph 3, what does the author mean when he writes “the photo was almost completely in his eyes”?
- A. The image in the man’s photo was too close-up.
  - B. The lighting in the man’s photo was too bright.
  - C. The man’s eyes revealed the man’s personality.
  - D. The man’s eyes were too large and ruined the photograph.
31. When taking portraits, the author worries least about getting
- A. people too comfortable.
  - B. the subject close enough.
  - C. the lighting right for the subject.
  - D. the photograph right the first time.
32. The author of the article is now
- A. a newspaper reporter.
  - B. a retired photographer.
  - C. a photographer specializing in portraits.
  - D. an inventor trying to improve digital cameras.
33. The two photographs with the article show
- A. the best lighting techniques.
  - B. the contrast between digital and film.
  - C. what good portraits look like.
  - D. how to take landscape photographs.
34. This article would **most likely** be found in a
- A. magazine for photography hobbyists.
  - B. journal for professional photographers.
  - C. digital photography entry in an encyclopedia.
  - D. memoir written by a famous photographer.



In “The First Book” and “Unfolding Bud,” the poets describe the experience of reading in different ways. Read both poems and then answer the questions that follow.

### The First Book

Open it.

Go ahead, it won’t bite.  
Well . . . maybe a little.

More a nip, like. A tingle.  
5 It’s pleasurable, really.

You see, it keeps on opening.  
You may fall in.

Sure, it’s hard to get started;  
remember learning to use

10 knife and fork? Dig in:  
You’ll never reach bottom.

It’s not like it’s the end of the world—  
just the world as you think

you know it.

—Rita Dove

### Unfolding Bud

One is amazed  
By a water-lily bud  
Unfolding  
With each passing day,  
5 Taking on a richer color  
And new dimensions.

One is not amazed,  
At a first glance,  
By a poem,  
10 Which is as tight-closed  
As a tiny bud.

Yet one is surprised  
To see the poem  
Gradually unfolding,  
15 Revealing its rich inner self,  
As one reads it  
Again  
And over again.

—Naoshi Koriyama



**Mark your answers in the section marked “Reading—Session 2” in your Student Response Booklet.**

35. In line 11 of “The First Book,” what does the phrase “You’ll never reach bottom” suggest?
- A. Reading is very challenging for people.
  - B. Reading provides endless possibilities.
  - C. Reading is very time consuming.
  - D. Reading provides uplifting stories.
36. What do the last three lines of “The First Book” suggest about reading?
- A. It can be enjoyed throughout one’s life.
  - B. It is easier than some people think.
  - C. It changes a person’s perspective on life.
  - D. It can be a frightening experience.
37. Which line from “The First Book” provides the **best** example of the poet’s encouraging tone?
- A. “Go ahead, it won’t bite.”
  - B. “Well . . . maybe a little.”
  - C. “You may fall in.”
  - D. “It’s not like it’s the end of the world—”
38. In “Unfolding Bud,” why is a poem compared to a flower bud?
- A. to show that a poem is amazing at first glance
  - B. to show that a poem is beautiful from start to finish
  - C. to show that a poem gradually reveals its inner layers
  - D. to show that a poem can eventually fade and be forgotten
39. According to “Unfolding Bud,” how is a “water-lily bud” different from a poem?
- A. A water-lily’s beauty has more depth.
  - B. A water-lily’s beauty is more apparent.
  - C. A water-lily reveals itself more slowly.
  - D. A water-lily is appreciated by fewer people.
40. What does the word rich mean as it is used in line 15 of “Unfolding Bud”?
- A. strong
  - B. hidden
  - C. elaborate
  - D. confusing
41. Which line from “The First Book” **most closely** relates to the theme of “Unfolding Bud”?
- A. “It’s pleasurable, really.”
  - B. “You see, it keeps on opening.”
  - C. “You may fall in.”
  - D. “Sure, it’s hard to get started;”



## Reading Session 3

**This test session includes a reading selection, multiple-choice questions, and a question for which you must write out your answer. After you read the selection, answer the questions about it in the spaces provided in your Student Response Booklet. You may not use a dictionary or any other reference tool during this session.**

### The Train Trip

The passage “The Train Trip” used for the following items was taken from *One Writer’s Beginnings* by Eudora Welty (1983, Warner Books). Due to copyright restrictions, we are unable to reprint the passage in this document.



69. In the first paragraph, what does the father **most** appreciate about the train trip?
- A. the beauty of the scenery
  - B. the conversation with his daughter
  - C. the regularity of the train
  - D. the book he is reading
70. In paragraph 2, the **first** sentence shows that the father and daughter
- A. keep their thoughts to themselves.
  - B. feel little excitement watching the small towns pass.
  - C. point out beautiful scenery to each other.
  - D. are alike in their knowledge of trains.
71. In paragraph 2, the narrator says, "we each lost ourselves in the experience of not missing anything, of seeing everything, of knowing each time what the blows of the whistle meant." What mood does this sentence create?
- A. engagement
  - B. dread
  - C. spontaneity
  - D. innocence
72. In paragraph 3, the narrator's use of the word "bear" suggests she feels that carrying the cup is
- A. an adult activity.
  - B. a testimony of her love for her father.
  - C. a great privilege for a child.
  - D. an annoying chore.
73. In paragraph 4, the imagery **most** describes
- A. the scraping sound of unseen folding chairs on the platform.
  - B. the roar of the train racing through the night.
  - C. the dark, still houses the train leaves behind.
  - D. the tiny specks of light glowing in the darkness.
74. In paragraph 5, the image of a humming insect is used to describe the sound of the
- A. fan.
  - B. train.
  - C. shade.
  - D. porter.



75. The long sentences in paragraphs 5 and 6 create a sense of the
- A. tension of the passengers.
  - B. haziness of the smoky car.
  - C. rhythmic movement of the train.
  - D. muffled whispers in the sleeping car.
76. The imagery in paragraph 6 appeals mainly to the sense of
- A. seeing.
  - B. hearing.
  - C. touching.
  - D. smelling.
77. In paragraph 7, the words “the encroaching walls of mountains woke me by clapping at my ears” describe the train
- A. crossing a river.
  - B. passing a train station.
  - C. pounding the tracks.
  - D. nearing a tunnel.
78. In paragraph 7, the word lulled means
- A. soothed.
  - B. pleased.
  - C. invigorated.
  - D. amazed.
79. Based on paragraph 8, for the narrator the world outside the train suggested
- A. the possibilities of life.
  - B. memories of her father.
  - C. future trips with her father.
  - D. stories she had heard.
80. The narrator of the passage is
- A. a child telling her mother about a trip.
  - B. a child writing a journal as she rides the train.
  - C. an adult looking back on an experience.
  - D. an adult writing a journal as she rides the train.



**Write your answer in the space provided for it in your Student Response Booklet.**

81. Explain how the train ride means different things to the father and the daughter. Use specific details from the passage to support your answer.

# Mathematics

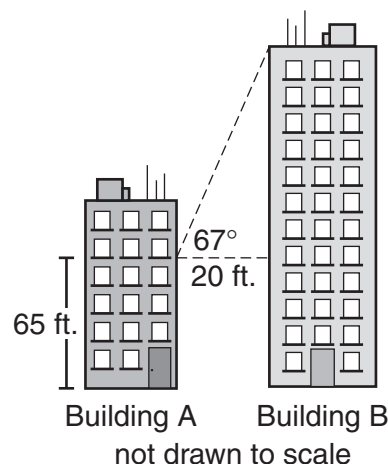
## Session 1 (No Calculator)

This test session includes multiple-choice questions and questions for which you must show your work or write out your answer. You may NOT use a calculator during this session.

Mark your answers in the section marked "Mathematics—Session 1 (No Calculator)" in your Student Response Booklet.

1. Lake Superior contains approximately 3,200,000,000,000,000 gallons of water. How is this number written in scientific notation?
- A.  $3.2 \times 10^{14}$
  - B.  $3.2 \times 10^{15}$
  - C.  $32 \times 10^{14}$
  - D.  $32 \times 10^{15}$

4. From a window in Building A, the angle of elevation to the top of Building B is  $67^\circ$ , as shown below.

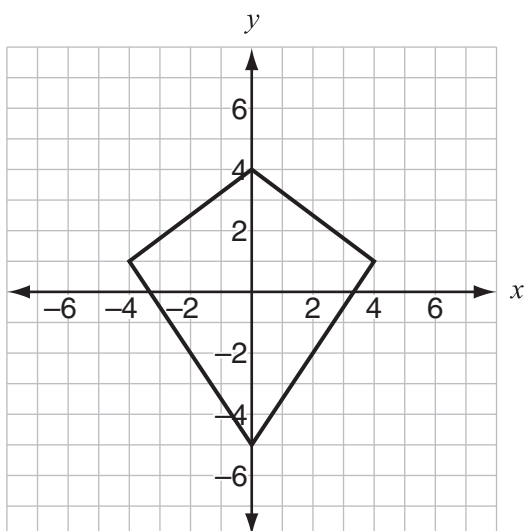


If the window in Building A is 65 feet above the ground and the distance between the buildings is 20 feet, which expression can be used to find the height of Building B?

- A.  $20 \sin 67^\circ$
- B.  $65 + 20 \sin 67^\circ$
- C.  $20 \tan 67^\circ$
- D.  $65 + 20 \tan 67^\circ$



9. Study the kite on the coordinate grid below.



What is the exact perimeter of the kite?

- A.  $10 + 2\sqrt{13}$   
B.  $10 + 4\sqrt{13}$   
C.  $50 + 2\sqrt{13}$   
D.  $50 + 4\sqrt{13}$
10. If  $x < 0$ , which expression has a negative value?
- A.  $x^3$   
B.  $(-x)^3$   
C.  $x^{-2}$   
D.  $(-x)^2$

12. Water flows into a tank at a constant rate. The table below shows the relationship between the amount of water in the tank and the time passed since the water began to flow.

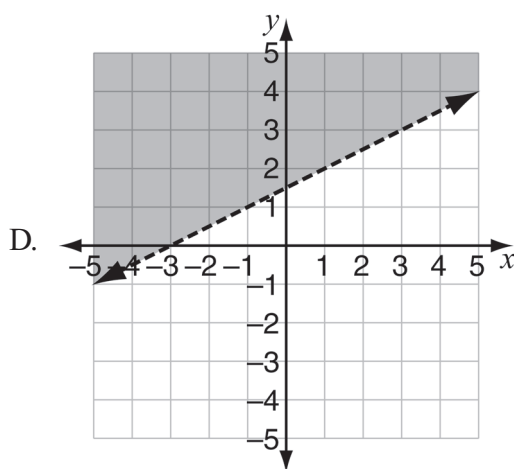
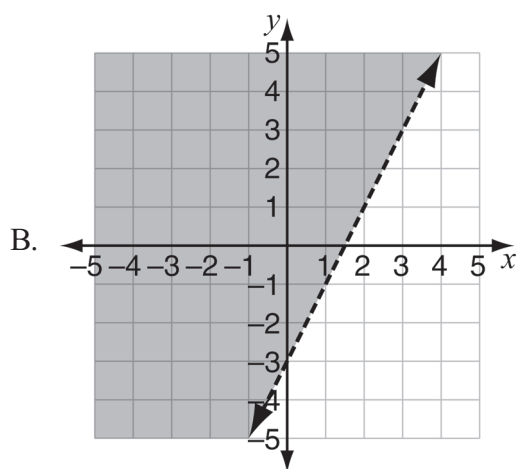
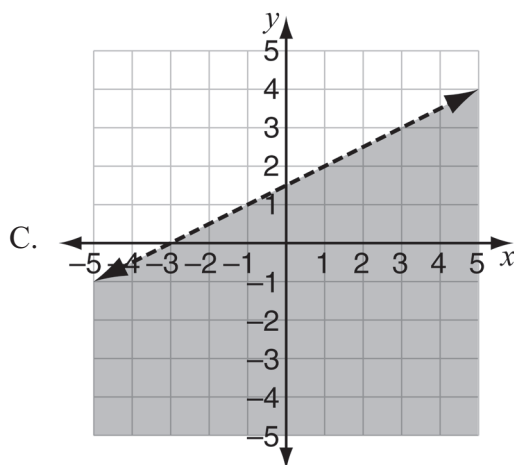
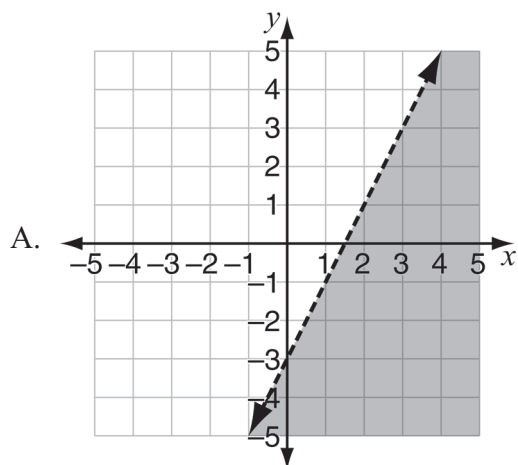
Time (minutes)	1	2	5	10
Amount of Water (liters)	3.5	5	9.5	17

Based on the table, which equation shows the relationship between the amount,  $a$ , in liters, of water in the tank and  $t$ , the time, in minutes, after the water began to flow?

- A.  $a = 1.5 + 3.5t$   
B.  $a = 3.5 + 1.5t$   
C.  $a = 2 + 1.5t$   
D.  $a = 1.5 + 2t$
13. Which expression has a value that is **not** a rational number?
- A.  $\sqrt[3]{-8}$   
B.  $\sqrt{16-9}$   
C.  $(3-5)^{-3}$   
D.  $|3-2^2|$



17. Which graph shows the solution of the inequality  $2x - y < 3$ ?



**Write your answers in the spaces provided in your Student Response Booklet. Show all of your work.**

18. Solve for  $x$ :

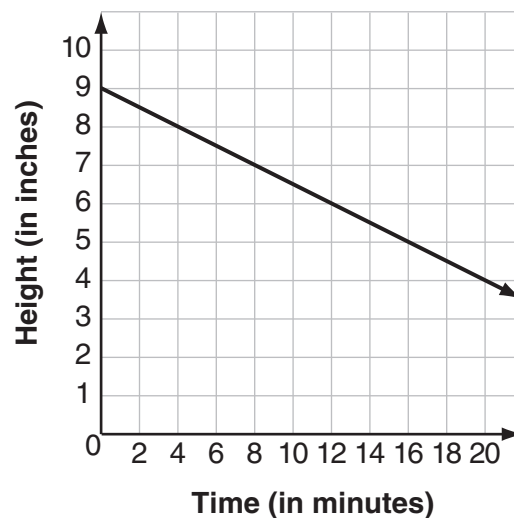
$$-4(3x - 6) + 2x = 34$$

19. Evaluate:

$$6 + 4 \times 5^2 \div 2$$

**Write your answer in the space provided for it in your Student Response Booklet. Show all of your work.**

23. The graph below shows the height of a candle as it burns.



- What is the meaning of the  $y$ -intercept in this situation?
- What is the meaning of the slope in this situation?
- Write a linear equation that represents the height,  $y$ , in inches, of the candle when it has been burning for  $x$  minutes.
- What is the  $x$ -intercept of the line? Show or explain how you found your answer.



# Mathematics

## Session 2 (Calculator)

This test session includes multiple-choice questions. You may use a calculator during this session.

Mark your answers in the section marked "Mathematics—Session 2 (Calculator)" in your Student Response Booklet.

24. Last year a store sold 702 hats. This is 130% of the number of hats sold the previous year. How many hats were sold the previous year?
- A. 540
  - B. 572
  - C. 832
  - D. 913
25. Ian walks 300 yards due west, turns, walks 800 yards due south, turns again, and then walks 100 yards due east. How far, to the nearest yard, is Ian from his starting point?
- A. 26 yards
  - B. 32 yards
  - C. 825 yards
  - D. 894 yards
29. Triangle  $JKL$  is drawn on a coordinate plane. It is a right triangle with hypotenuse  $\overline{JL}$ . The slope of  $\overline{JK}$  is  $\frac{3}{4}$ . What is the slope of  $\overline{KL}$ ?
- A.  $\frac{4}{3}$
  - B.  $\frac{3}{4}$
  - C.  $-\frac{3}{4}$
  - D.  $-\frac{4}{3}$



35. A large juice can is a cylinder that has a diameter of 6 inches and a height of 14 inches. What is the approximate total surface area of the can? (Note: Use 3.14 for  $\pi$ .)

A. 490 square inches  
B. 320 square inches  
C. 283 square inches  
D. 264 square inches

38. A waiter uses the equation below to estimate the amount of money,  $y$ , in dollars, he will earn in a month if his customers spend a total of  $x$  dollars.

$$y = 500 + 0.15x$$

One month, the waiter expects that his customers will spend \$1000 more than his customers spent the previous month. How much more money does he expect to earn compared with what he earned in the previous month?

A. \$1500  
B. \$1000  
C. \$ 650  
D. \$ 150

39. The heights of the players on a basketball team are shown below.

Heights	
6	3 4 8 8 8 9
7	0 2 2 2 6 8
8	0

**Key**  
6|3 = 63 inches

Caleb also plays on the team, but is not included in this stem-and-leaf plot. He is between 75 and 80 inches tall. Which measure of the team's heights **cannot** be determined without knowing Caleb's actual height?

A. mean  
B. median  
C. mode  
D. range

40. A study of traffic patterns on one length of road with three traffic lights revealed the following probabilities:

- There is a 0.6 probability of being stopped by the second traffic light if stopped by the first traffic light.
- There is a 0.2 probability of being stopped by the third traffic light if stopped by the second traffic light.

Of 100 drivers who are stopped by the first traffic light, how many are stopped by the second traffic light but **not** by the third?

A. 80 drivers  
B. 48 drivers  
C. 14 drivers  
D. 12 drivers



42. Carmen wants to survey students to determine how often they use the Internet. Which group would be the **best** to survey?

A. students in the computer lab  
B. students with e-mail addresses  
C. students entering the school building  
D. students in her 12th-grade English class

44. The recipe for a salad is below.

Ingredient	Amount	Calories
Spinach	4 cups	7 per cup
Avocado	$\frac{2}{3}$ cup	240 per cup
Beet	$1\frac{1}{2}$ cups	20 per $\frac{1}{4}$ cup
Olive Oil	2 tablespoons	120 per tablespoon
Vinegar	3 tablespoons	2 per tablespoon

If the recipe makes 6 servings of salad, about how many calories are in 1 serving?

A. 65  
B. 77  
C. 92  
D. 111

45. After flying at a constant altitude, an airplane descends toward an airport. The equation below shows the altitude,  $a$ , in feet, of the airplane  $t$  minutes after it began to descend.

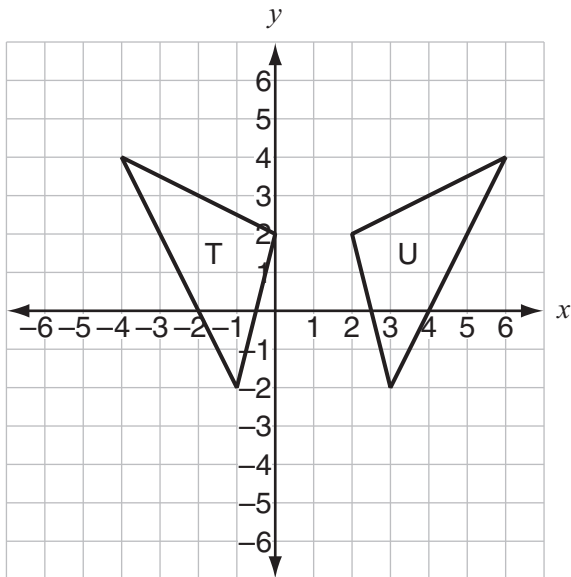
$$a = 5500 - 600t$$

According to this equation, which statement is true?

A. The airplane takes 600 minutes to descend for landing.  
B. The airplane was at an altitude of 5500 feet before it began to descend.  
C. The airplane descends at a rate of 5500 feet per minute.  
D. The airplane was 600 feet from the airport when it began to descend.



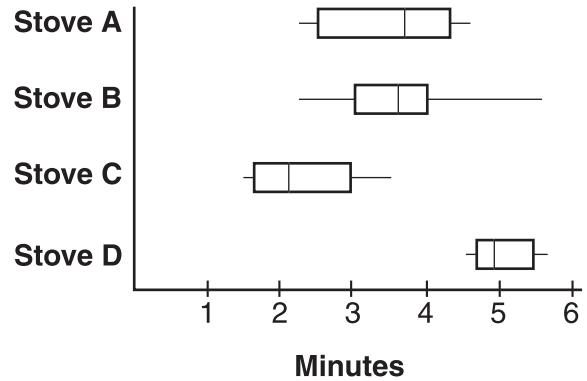
46. Study the triangles on the coordinate plane below.



Which transformation can be applied so that triangle U is the image of triangle T?

- A. reflection over the  $y$ -axis
- B. reflection over the line  $x = 1$
- C.  $90^\circ$  clockwise rotation about  $(1, 2)$
- D.  $90^\circ$  clockwise rotation about the origin

47. A consumer testing company studied several brands of electric stoves to see how long it took to boil 4 cups of water in a covered saucepan at the highest burner setting. Each stove was tested 20 times. The box-and-whisker plots below show the results of this study.



Which stove is most predictable in terms of the time it takes to boil water?

- A. Stove A
- B. Stove B
- C. Stove C
- D. Stove D

# Mathematics

## Session 3 (Calculator)

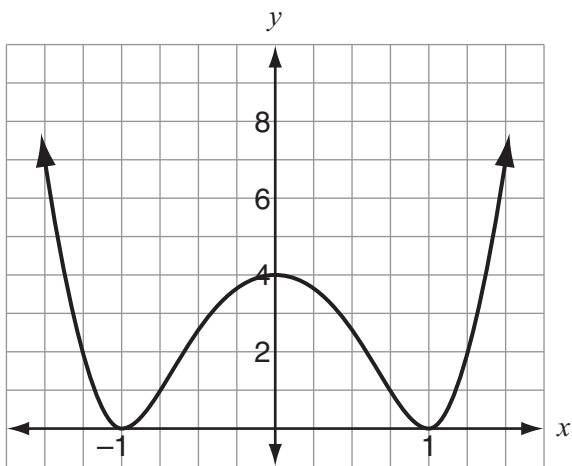
This test session includes multiple-choice questions. You may use a calculator during this session.

Mark your answers in the section marked "Mathematics—Session 3 (Calculator)" in your Student Response Booklet.

51. In 1996, the record time to run 200 meters was 19.32 seconds. About how many kilometers per hour is this?

A. 373 kilometers per hour  
 B. 107 kilometers per hour  
 C. 37 kilometers per hour  
 D. 10 kilometers per hour

52. The graph below shows the equation  $y = 4x^4 - 8x^2 + 4$ .



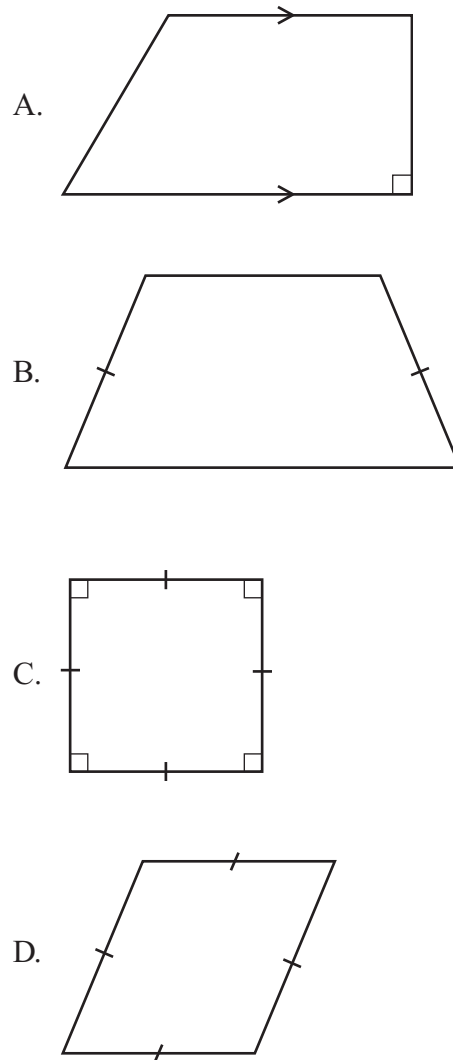
Over which interval of  $x$ -values do the  $y$ -values increase at the fastest rate?

A. from  $-1.5$  to  $-1$   
 B. from  $-1$  to  $0$   
 C. from  $0$  to  $1$   
 D. from  $1$  to  $1.5$

59. Read the statement below.

If a quadrilateral has four congruent sides, then its diagonals are congruent.

Which figure provides a counterexample to this statement?



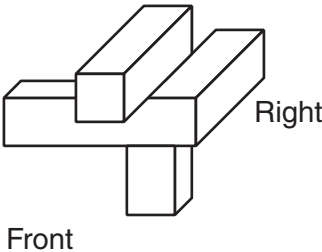
66. The chart below shows the ages of people who responded to a survey.

Age (in years)	Number of People
Under 25	80
25–35	200
36–45	270
46–55	120
Over 55	130

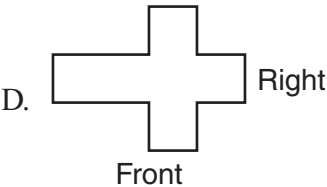
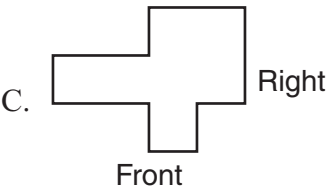
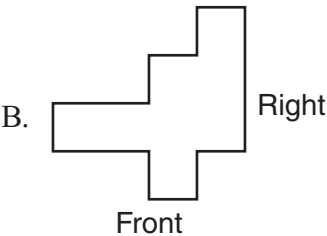
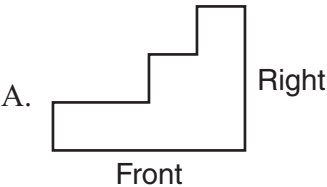
One of these people is selected at random. What is the probability that person is 35 years old or younger?

- A. 54%
- B. 40%
- C. 35%
- D. 25%

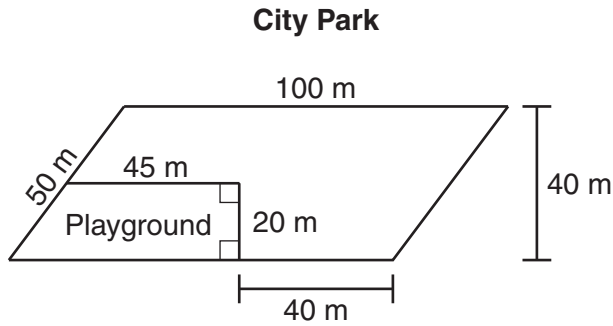
67. Two congruent L-shaped blocks were attached to make the structure shown below.



Which figure shows the top view of this structure?



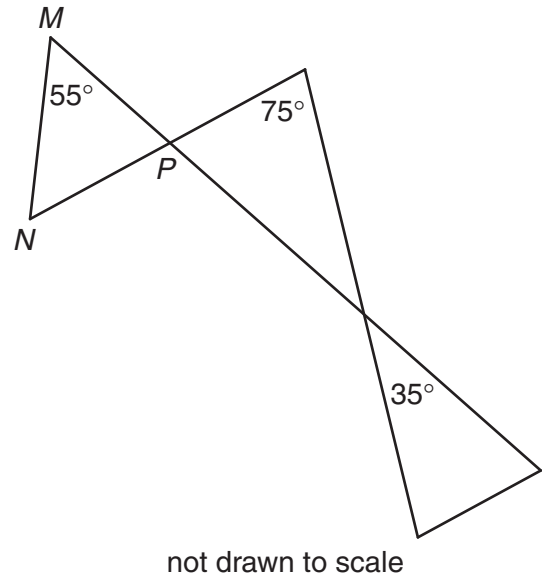
69. A city park is in the shape of a parallelogram as shown below.



Except for the playground, the city park is covered by grass. What is the area covered by grass?

- A. 2950 square meters
  - B. 3100 square meters
  - C. 3950 square meters
  - D. 4100 square meters
70. Jamie collected data comparing the lengths of caterpillars and the wingspans of the resulting butterflies. Which type of graph would be most appropriate for Jamie to display her data?
- A. histogram
  - B. scatter plot
  - C. circle graph
  - D. box-and-whisker graph

71. Study this figure.



Which term describes  $\triangle MNP$ ?

- A. obtuse
- B. scalene
- C. isosceles
- D. equilateral

# Science

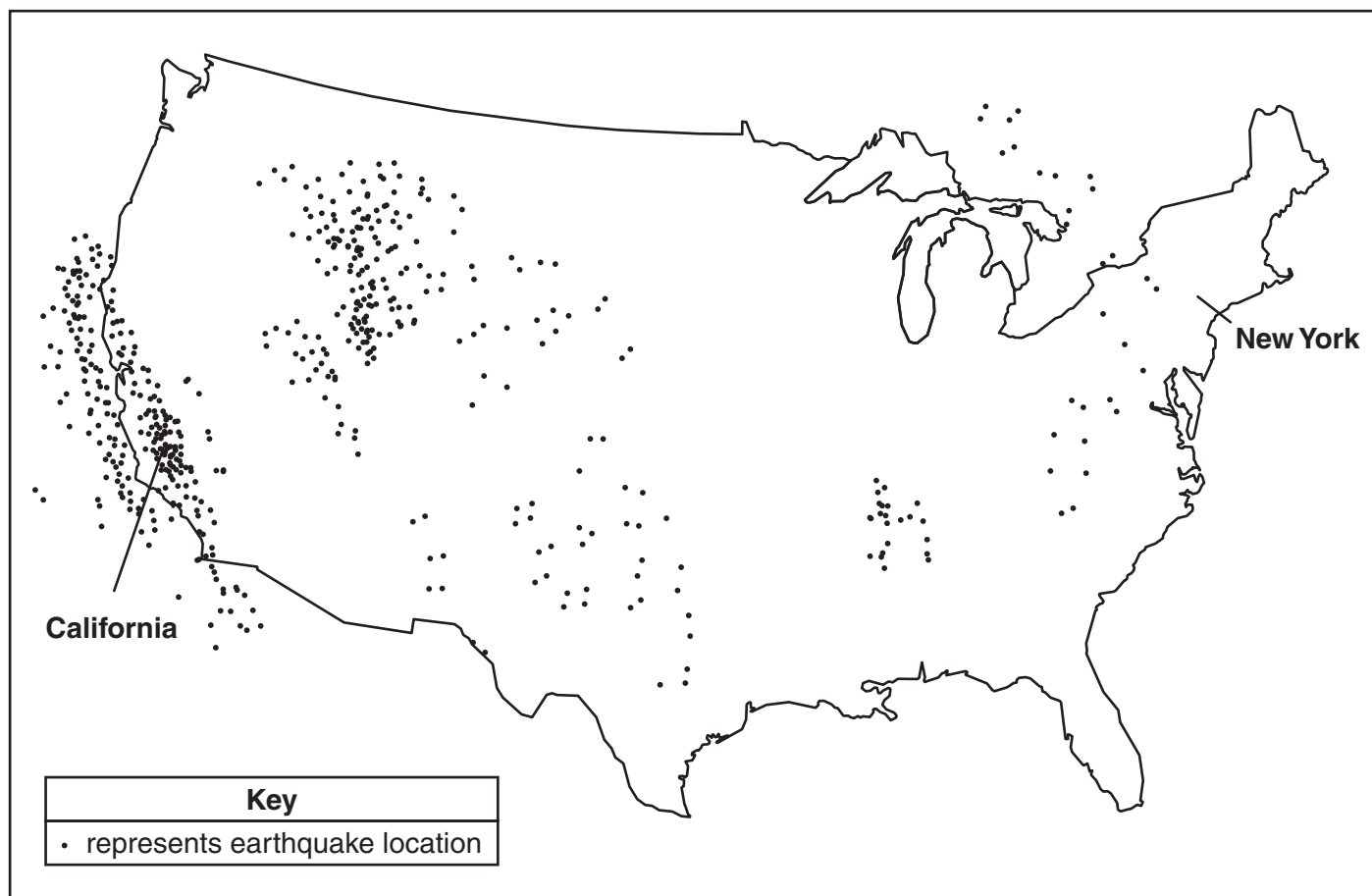
## Session 1

This test session includes multiple-choice questions and a question for which you must write out your answer. Be sure to answer all parts of the question.

Mark your answers in the section marked "Science—Session 1" in your Student Response Booklet.

1. The map below shows where earthquakes have occurred in and near the United States.

**Earthquake Distribution**



Why do earthquakes occur more frequently in California than in New York?

- A. Rocks in California are older than rocks in New York.
- B. California is over a hot spot, but New York is not.
- C. Mountains in California are older than mountains in New York.
- D. California is located on a plate boundary, and New York is located on the middle of a plate.





2. Why are carbohydrates important to the human body?
- A. They function as enzymes to speed up cell reactions.
  - B. They act as the body's primary energy source.
  - C. They provide the materials used to build muscle structure.
  - D. They produce vitamins D and K.
3. Throughout World War II, the U.S. Navy collected large amounts of data that showed details of the seafloor. Which idea was revived because of these data?
- A. Earth's surface is made up of moving plates.
  - B. The ocean bottom is extremely stable.
  - C. Organisms with adaptations are more likely to survive.
  - D. Some ecosystems on the seafloor rely on chemical energy.

4. A scientist set up the table shown below before beginning her experiment.

**Plant Experiment Data**

Number of Plants (per 400 cm <sup>2</sup> area)	Average Growth of Plants (cm per week)
4	
8	
12	
16	
20	

Which question is the scientist **most likely** planning to answer?

- A. Which types of plants grow more than 4 cm per week?
  - B. Why does the number of plants in an area change over time?
  - C. How does crowding affect the growth of plants?
  - D. Can some plant species grow over 40 cm tall?
5. Heat energy from the ocean enters the atmosphere, warming the air closest to the ocean's surface. Which type of atmospheric flow will result from this heat transfer?
- A. The air will rise as it cools and the warm air will sink.
  - B. The warm air will rise and the cool air will sink.
  - C. The air will move to the east because of Earth's rotation.
  - D. The air will move toward the North Pole until it cools back to its original temperature.



8. Which statement **best** describes the periodic table?
- A. In the periodic table, the vertical columns represent elements with similar chemical properties.
  - B. In the periodic table, the horizontal rows represent elements with similar physical properties.
  - C. The periodic table lists the elements in the universe in alphabetical order.
  - D. The periodic table lists the elements in the universe in the order they were discovered.
9. A student is investigating whether higher water temperatures increase the rate of photosynthesis in algae. Which of the following is the **best** design for her investigation?
- A. one set of algae in 10°C water
  - B. several sets of algae in 40°C water
  - C. one set of algae in 10°C water and one set in 40°C water
  - D. several sets of algae in water ranging from 10°C to 40°C
10. Many people disagree about whether stem cell research should be conducted. Since 2001, the U.S. government has withheld funding for certain kinds of stem cell research.
- Which issue is the basis for most of this controversy?
- A. consequences
  - B. cost
  - C. ethics
  - D. limitations
11. Each kernel on an ear of corn is a seed, or offspring, from the parent plant. Genetically, starchy kernels are dominant to sweet kernels.
- If two corn plants heterozygous for starchy kernels are crossed, what ratio of starchy to sweet kernels would most likely be present in the offspring?
- A. 4 starchy : 0 sweet
  - B. 3 starchy : 1 sweet
  - C. 2 starchy : 2 sweet
  - D. 1 starchy : 3 sweet



15. A student wants to show that apple juice is toxic to African violets. He conducts a scientific experiment in which he pours apple juice on one group of African violets and pours water on another group of African violets. At the end of the experiment, the African violets that were exposed to apple juice were dead.

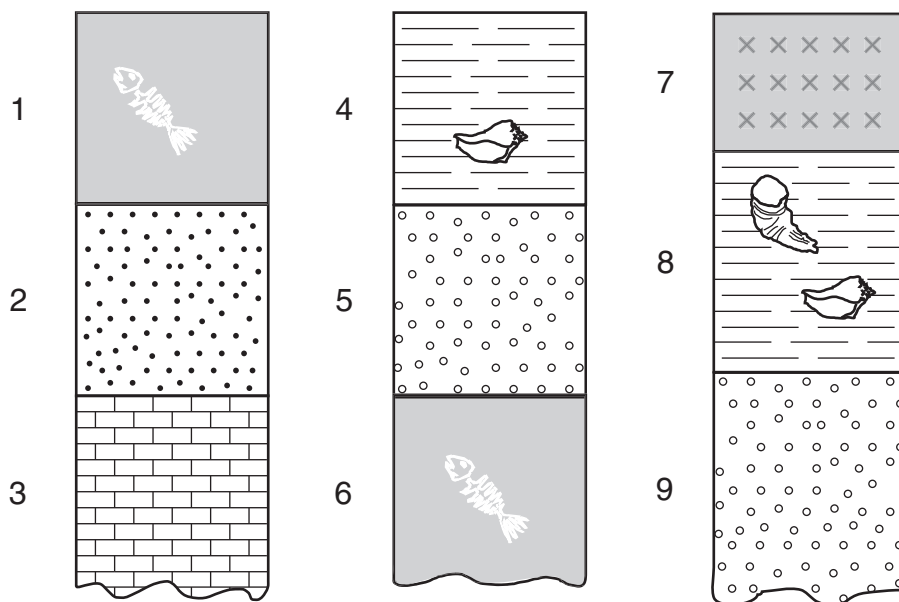
Before the student claims that apple juice is toxic to African violets, what should he do?

- A. He should perform a chemical analysis of the apple juice he used.
- B. He should determine whether other juices are toxic to African violets.
- C. He should repeat his experiment to see if he gets similar results.
- D. He should write a summary of his experiment and observations.

16. For all electromagnetic waves traveling through space, which characteristic always has the same numerical value?
- A. amplitude
  - B. frequency
  - C. speed
  - D. wavelength



17. A road cut is a place where part of a mountain or hill has been removed to make a road. The diagrams below show rock layers from three different road cuts near one another. In layers containing fossils, several fossils were found but the diagrams show only one fossil of each type.



Which rock layer is youngest?

- A. layer 1
  - B. layer 3
  - C. layer 4
  - D. layer 7
18. Ecologists believe a bull's-horn acacia plant (*Acacia sphaerocephala*) is so dependent upon ants (*Pseudomyrmex ferruginea*) that it barely survives without them. Which observation **best** supports this argument?
- A. Acacia shoots grown without the ants weigh less than 10% as much as shoots grown with the ants.
  - B. Acacia plants produce nectar and both fat and protein nodules for the ants.
  - C. Ants of this particular species are found on only this type of acacia plant.
  - D. More than 10,000 worker ants may be found on an acacia plant within one year of the ants colonizing the plant.
19. Based on how organisms are scientifically classified and named, which organisms are the most closely related and have the most similar features?
- A. *Vulpes vulpes* and *Lynx lynx*
  - B. *Lynx rufus* and *Canis rufus*
  - C. *Castor canadensis* and *Martes americana*
  - D. *Canis lupus* and *Canis rufus*



23. Which part of an atom determines how it interacts with other kinds of atoms?

- A. the protons
- B. the neutrons
- C. the whole nucleus
- D. the outermost electrons

24. A student decides to use a desk lamp to simulate sunlight. Which pair of materials should the student use to model the differences in heat absorption between a city and heat absorption in a rural area?

A.

Material for City	Material for Rural Area
Piece of asphalt	Pan of dirt

B.

Material for City	Material for Rural Area
Piece of glass	Pan of grass seedlings

C.

Material for City	Material for Rural Area
Bowl of freshwater	Bowl of salt water

D.

Material for City	Material for Rural Area
Bowl of white rice	Bowl of clear gelatin

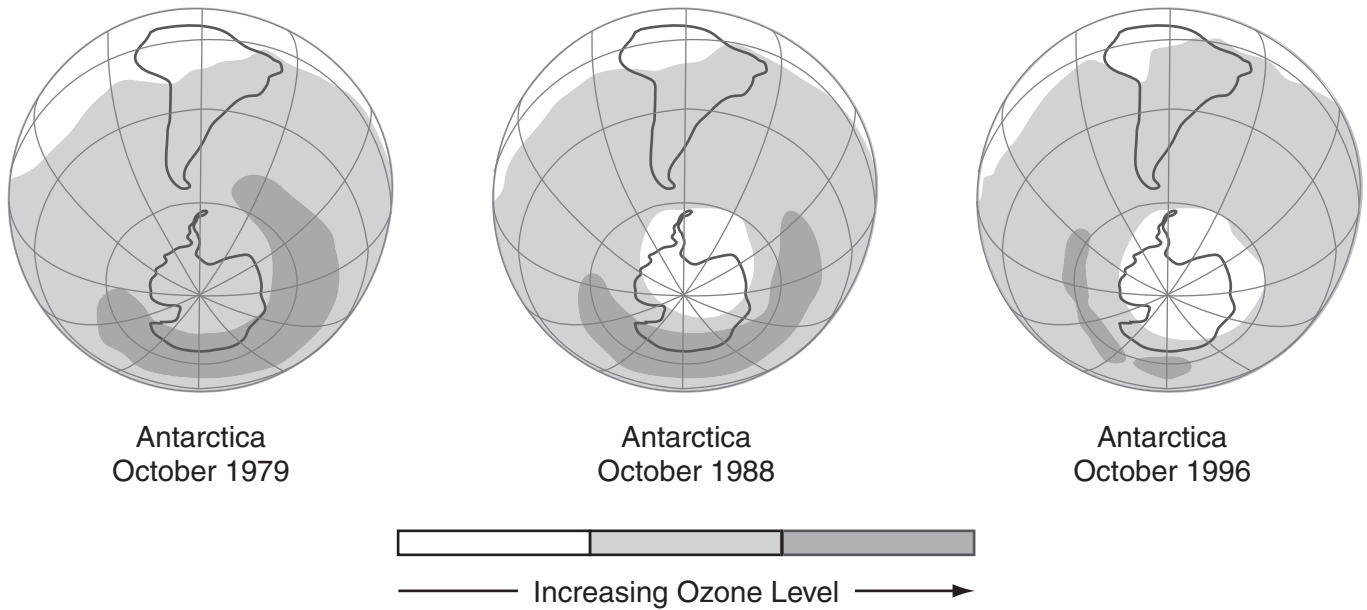
25. A roach bait has a sugary syrup that attracts roaches to eat the poison. A large number of roaches in Florida, however, have started to avoid the roach bait. Researchers have found that the roaches avoiding the bait do not like the glucose sugar in the syrup. The researchers estimate that 58% of the roach population now avoid the bait.

How did natural selection work to establish a large population of bait-resistant roaches?

- A. The roaches reproduced at a faster rate than the glucose bait was able to lure and poison them.
- B. The parent roaches taught their young to detect and avoid the glucose in the bait.
- C. The roaches that did not like glucose survived and reproduced, while the other roaches died.
- D. The roaches acquired the ability to distinguish glucose from other sugars through repeated exposure.



26. The diagrams below show the ozone level over Antarctica in October 1979, 1988, and 1996.



Which conclusion about the ozone level over Antarctica from 1979 to 1996 is **best** supported by these diagrams?

- A. It has continually increased.
- B. It has continually decreased.
- C. It has stayed the same.
- D. It has sometimes increased and sometimes decreased.



**Write your answer in the space provided for it in your Student Response Booklet.**

27. A student has a toy car. When she pulls it backward and then releases it, the toy car moves forward.
- Identify **two** forces acting on the toy car besides the force that pushes it forward.
  - The mass of the toy car is 0.05 kg, and the car accelerates  $0.1 \text{ m/s}^2$  when released. Calculate the net force acting on the car. Be sure to provide correct units with your answer.

## Science Session 2

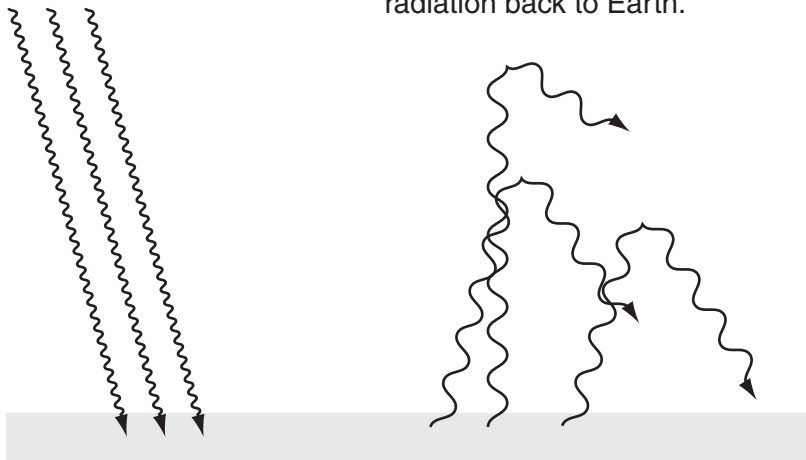
This test session includes multiple-choice questions.

Mark your answers in the section marked "Science—Session 2" in your Student Response Booklet.

28. Study the model below.

1. Incoming short-wave solar radiation heats Earth's surface.

3. Atmospheric gases absorb and reradiate some long-wave radiation back to Earth.



2. Objects on Earth's surface emit long wavelength radiation skyward.

Which phenomenon does this model explain?

- A. ozone buildups
- B. El Nino
- C. cloud formation
- D. greenhouse effect

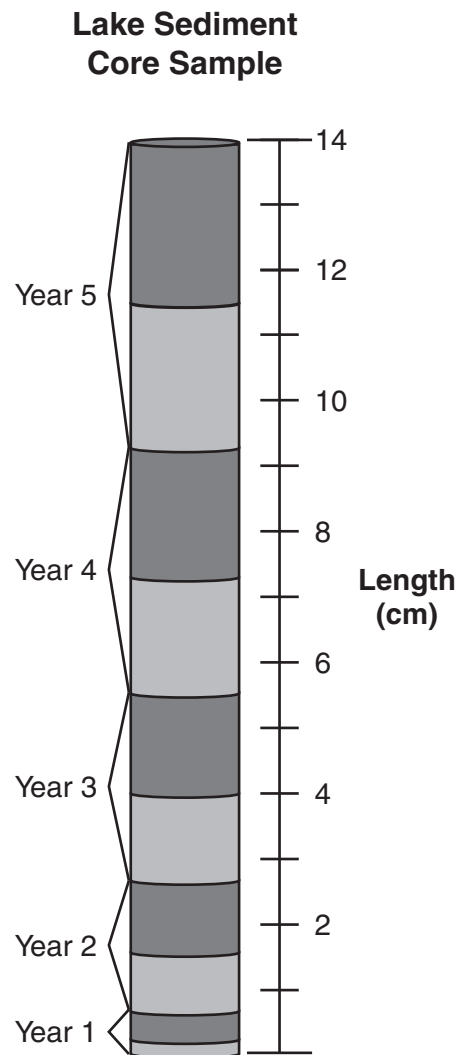




29. Which tool will **best** help a geologist observe crystals on the surface of a metamorphic rock?
- A. binoculars
  - B. hand lens
  - C. pocketknife
  - D. rock hammer
30. What is a function of a catalyst in a chemical reaction?
- A. Catalysts stop chemical reactions.
  - B. Catalysts speed up chemical reactions.
  - C. Catalysts provide oxygen in chemical reactions.
  - D. Catalysts remove water in chemical reactions.
31. Many male birds spend a large amount of time defending their territory. What is the **most** important reason for male birds to defend their territory?
- A. to guarantee they will survive the season
  - B. to attract more bird species to the area
  - C. to improve their chances of mating
  - D. to establish a place to stay all winter
35. Which process causes earthquakes?
- A. rocks shifting under stress
  - B. pressure from the weight of oceans
  - C. Earth's crust melting and collapsing
  - D. waves created by temperature differences
36. Which technological advance was most directly made possible by Newton's laws?
- A. car battery
  - B. microwave oven
  - C. musical amplifier
  - D. space shuttle
37. Rocks farther from a mid-ocean ridge are older than rocks near a mid-ocean ridge. Which statement uses the theory of plate tectonics to explain this trend?
- A. Faults form along mid-ocean ridges.
  - B. New crust forms at mid-ocean ridges.
  - C. Earthquakes commonly occur at mid-ocean ridges.
  - D. Convection currents move together under the crust.



38. The core sample shown below was collected from a lake bed. Every year, one dark layer and one light layer formed. The dark layer is assumed to have formed during the six cooler months of the year, and the light layer is assumed to have formed during the six warmer months of the year.



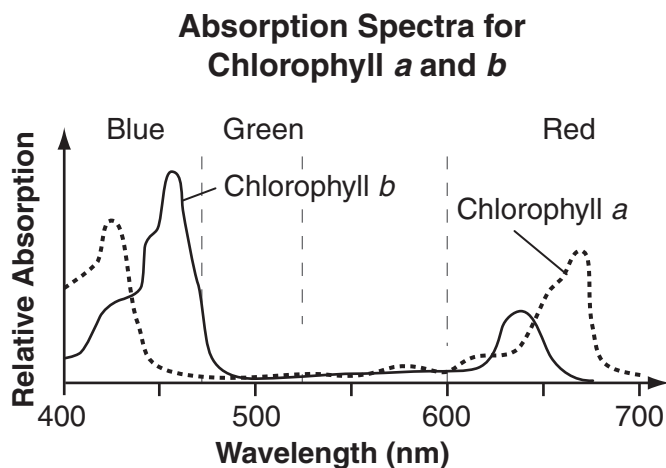
Based on only this scale drawing of the core sample, which statement explains the **most likely** interpretation about sediment deposition in the lake?

- A. A large storm increased sediment deposition during Year 2 of this sample.
- B. The rate of sediment deposition in the lake was constant during the five years represented by this sample.
- C. The rate of sediment deposition in the lake increased during the five years represented by this sample.
- D. A drought caused more sediment deposition in the lake during Year 4 of this sample.



42. Which statement about the neutrons in a carbon atom is correct?
- The number of neutrons accounts for all of a carbon atom's mass.
  - The neutrons are the glue that holds a carbon atom's nucleus together.
  - The neutrons in a carbon atom each have no charge.
  - The number of neutrons in a carbon atom determines the carbon atom's chemical activity.

43. The graph below shows the absorption spectra for chlorophyll *a* and *b*.



Which statement about the absorption of light by chlorophyll pigments is correct?

- Only chlorophyll *a* can absorb red light.
- Chlorophyll *a* absorbs a lot of green light.
- Only chlorophyll *b* absorbs two different colors of light.
- Chlorophyll *b* absorbs more blue light than red light.

44. How are most animal cells structured to efficiently perform a variety of functions?
- They have many specialized parts.
  - They are large.
  - They contain two nuclei.
  - They have multiple copies of DNA.
45. A scientist studying great blue herons collected these data during an experiment.

**Great Blue Heron Data**

Size of Group	Food Intake (g/min)
1	1.5
5	1.6
10	2.1
15	3.8
20	4.8
25	3.6
30	5.0

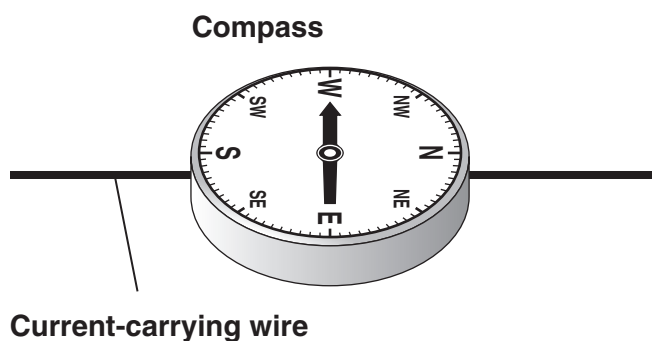
What was the **independent** variable in the experiment?

- the species of heron
- the size of the group
- the amount of food intake
- the length of feeding time



46. The half-life of carbon-14 is about 5,800 years. How old is a fossilized beetle that still has 25% of its original carbon-14?
- A. 1,450 years
  - B. 4,350 years
  - C. 5,800 years
  - D. 11,600 years

50. A student holds a small compass over a wire carrying a current. The compass needle points away from north, as shown below.



Which conclusion should the student make?

- A. Earth's magnetic field is moving.
- B. Earth's magnetic field is switching its north and south poles.
- C. Electric currents move perpendicular to Earth's magnetic field.
- D. Electric currents exert a magnetic force on the compass.

51. Which piece of evidence supports the theory that all mammals evolved from a common ancestor?
- A. The bones of mammals are plentiful in the fossil record.
  - B. Most modern mammals are known to live on land.
  - C. The molecular sequences for proteins in mammals are fairly alike.
  - D. All mammal species can reproduce sexually.



52. Study the diagram below.



Which conditions make winter snowstorms common in Buffalo, NY?

- A. Water does not hold heat as well as land, so cold lake water chills the air overhead and forms snow downwind of the lake.
- B. Cold air passes over warmer lake water and picks up water vapor, which condenses as snow when it passes over cooler land and the air cools.
- C. Cold air gets water from the cold lake and warms while passing over land. Condensation then occurs because warm air holds less water vapor than cool air.
- D. Warm lake water heats cold air, making the air less able to hold water vapor. Condensation then occurs when the warmer air becomes saturated.

53. If a starchy food is chewed long enough, it will taste sweet. The sweet taste indicates that the starch has been broken down into sugar by an enzyme called amylase, which is found in saliva.

A student is investigating this fact by adding crackers to test tubes that contain different amounts of amylase.

Which question is the student **most likely** trying to answer?

- A. How much amylase is needed to release sugar from a starch?
- B. What effect does chewing have on the production of amylase?
- C. Where does the amylase go after the sugar is released from the starch?
- D. When does amylase begin to react with a starch?

## Science Session 3

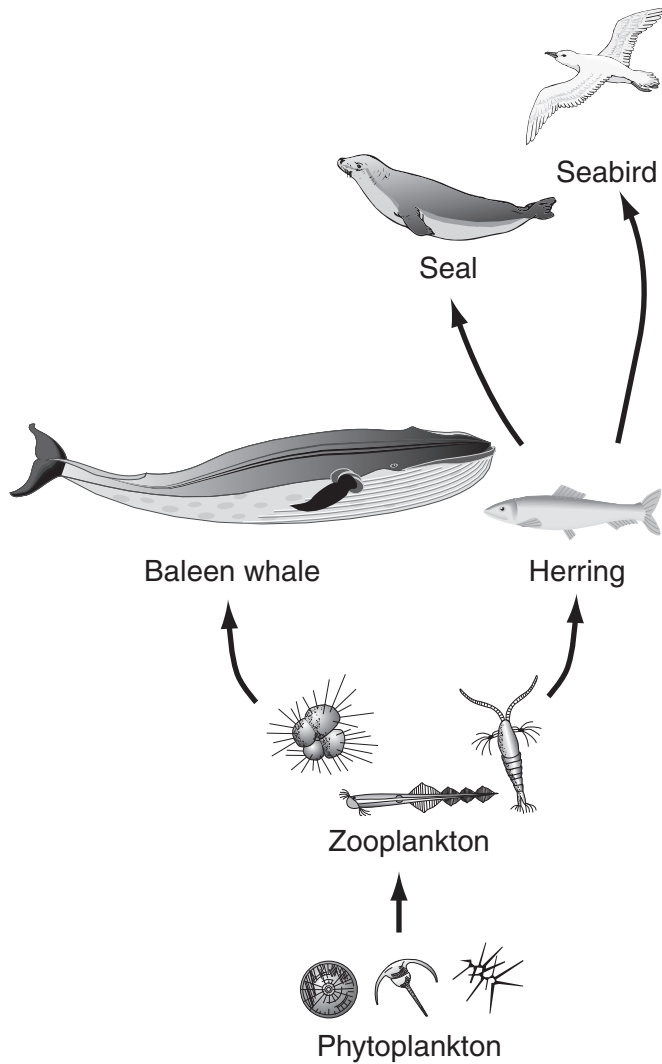
This test session includes multiple-choice questions and a question for which you must write out your answer. Be sure to answer all parts of the question.

Mark your answers in the section marked "Science—Session 3" in your Student Response Booklet.

55. Which major process forms a folded mountain range such as the Appalachian Mountains in the eastern United States?
- A. lava layers building up
  - B. a large coral reef eroding
  - C. crustal plates moving together
  - D. a glacier retreating
56. The bison herd in the National Bison Range originated from two bulls and two cows. As the herd grew, additional individual bison were brought into the herd from other locations.
- Which reason for adding the new individuals was **most** important to the health of the bison population?
- A. The new bison brought competition to the herd.
  - B. The new bison brought different learned behaviors to the herd.
  - C. The new bison brought different food preferences to the herd.
  - D. The new bison brought genetic diversity to the herd.
57. Which characteristic of radioactive isotopes is **most** important for making it possible to estimate the age of matter?
- A. Radioactive isotopes are produced by all elements.
  - B. Radioactive isotopes decay at predictable rates.
  - C. Geiger counters can detect radioactive isotopes.
  - D. All soils produce radioactive isotopes.
58. Students in a science class wanted to find out which of two ponds contained the most mud particles in its water. They collected three 500-mL water samples at varying depths from each pond. After shaking the samples thoroughly, they poured the same amount of each sample into identical graduated cylinders. Each sample was allowed to settle for 24 hours. The thickness of the mud at the bottom of each cylinder was then measured.
- Which measurement **most likely** contained the greatest error?
- A. the amount of water collected
  - B. the depth at which each sample was collected
  - C. the thickness of the mud layer in each cylinder
  - D. the amount of time each sample settled



59. Study the food web below.



How would a decrease in the number of herring **most likely** affect the amount of energy available for the other organisms?

- A. There would be more energy available for the phytoplankton.
- B. There would be more energy available for the zooplankton.
- C. There would be less energy available for the baleen whales.
- D. There would be less energy available for the seals.

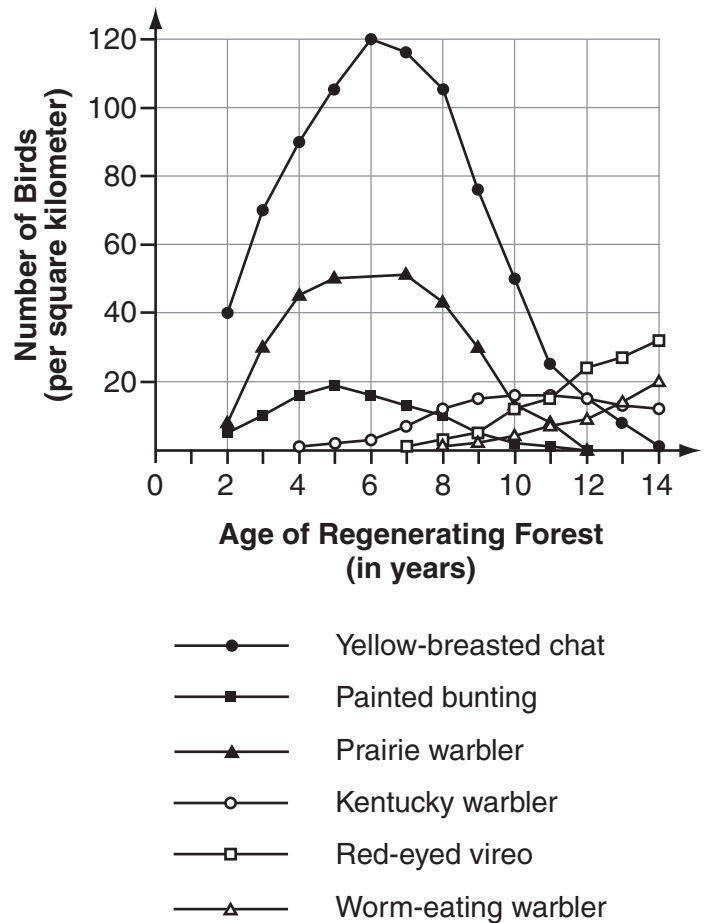
62. Which statement about the human genetic system is generally true?

- A. Each body cell should contain twenty-three pairs of chromosomes.
- B. Each body trait is controlled by a single pair of genes.
- C. Each individual produces both egg and sperm cells for sexual reproduction.
- D. Each body cell should contain only the genes it needs for its specific function.



63. Which gas did organisms add to the early atmosphere, enabling land animals to develop?
- A. argon
  - B. carbon dioxide
  - C. nitrogen oxide
  - D. oxygen

64. The graph below shows how the number of bird species in a regenerating forest changed over time.



Based on this information, which statement about the return of bird species to the regenerating forest is correct?

- A. It took six years for the bird species to return to the regenerating forest.
- B. The total number of birds becomes more abundant as the forest regenerates.
- C. The number of bird species is not as great now as it was before the forest began regenerating.
- D. The number of bird species changes as the forest regenerates.





65. The table below lists information about the alternative fuels biodiesel and ethanol.

	<b>Biodiesel</b>	<b>Ethanol</b>
<b>Main Source</b>	Waste cooking oil, soybean oil, or animal fats	Corn, grains, or farm waste
<b>Environmental Impacts</b>	Reduces particulates but may increase ozone-damaging chemicals	Decreases ozone-damaging chemicals
<b>Energy per Gallon Compared to Gasoline</b>	90% as much as gasoline	70% as much as gasoline
<b>Renewability</b>	Not renewable	Renewable

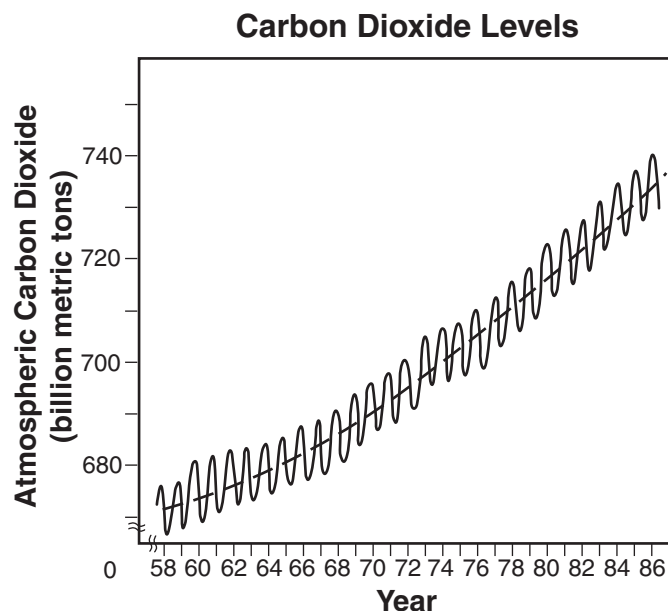
Which statement explains why biodiesel is a better alternative fuel choice than ethanol?

- A. Biodiesel comes from readily available agricultural products.
- B. Biodiesel has fewer negative environmental impacts.
- C. Biodiesel yields more energy per gallon.
- D. Biodiesel is not renewable.



69. In which circumstance will more water diffuse **into** the cell than out of the cell?
- A. if an amoeba is placed in ocean water
  - B. if a fish egg is placed in distilled water
  - C. if a plant cell is placed in salt water
  - D. if a red blood cell is placed in saline solution

70. The graph below shows how atmospheric carbon dioxide levels have changed since 1958.



Which factor **most likely** explains why the amount of atmospheric carbon dioxide fluctuates within each year?

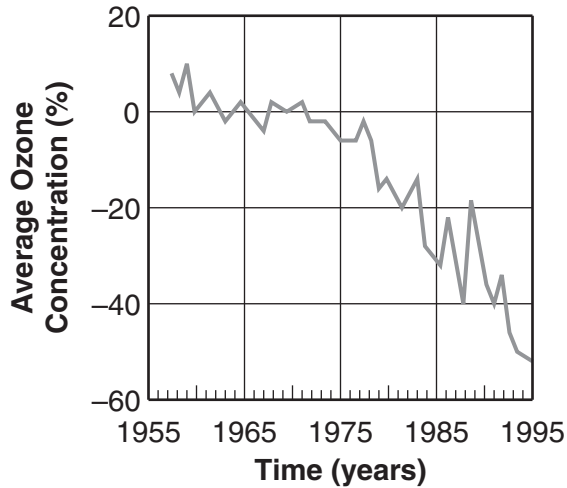
- A. the addition of carbon dioxide to the atmosphere from factories
- B. the addition of carbon dioxide to the atmosphere from cars
- C. seasonal changes in photosynthesis
- D. seasonal melting of Arctic ice caps



71. What happens when an atom of potassium (K) loses an electron and an atom of bromine (Br) gains that electron?
- A. The potassium atom loses a considerable amount of mass.
  - B. The bromine atom becomes unstable and gives off radioactive particles.
  - C. The potassium atom becomes positively charged and the bromine atom becomes negatively charged, creating an attractive force between the two atoms.
  - D. The potassium atom becomes an argon (Ar) atom and the bromine atom becomes a krypton (Kr) atom, creating two atoms with a low probability of reacting.
72. Which example **best** models the current movement of galaxies relative to one another?
- A. dots on a round balloon as the balloon is inflated
  - B. marks on a bicycle tire as the bicycle slowly moves
  - C. spots on a softball thrown across a field
  - D. ink spots on paper being crushed into a ball
73. During an experiment to determine the effectiveness of a new medicine, researchers give one group of subjects blue pills containing the new medicine and another group of subjects identical blue pills containing no active ingredients. The subjects do not know which type of pill they have received. What is the control group in this experiment?
- A. the subjects given the pills with the new medicine
  - B. the subjects given the pills with no active ingredients
  - C. all the subjects participating in the experiment
  - D. all the researchers conducting the experiment
77. Which of the following **best** models how the mass of a proton compares with the mass of an electron?
- A. the mass of a paper clip and the mass of a speck of dust
  - B. the mass of a basketball and the mass of a soccer ball
  - C. the mass of a 1 m ruler and the mass of a 30 cm ruler
  - D. the mass of a pencil and the mass of its eraser



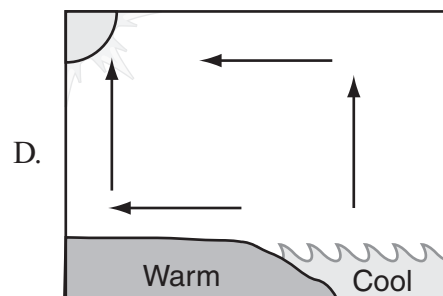
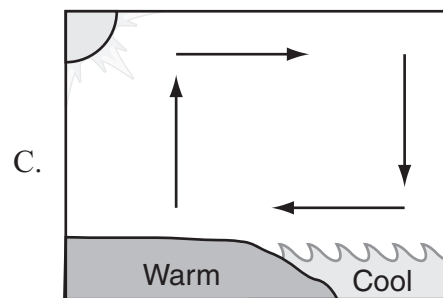
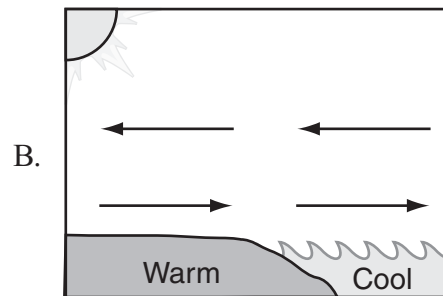
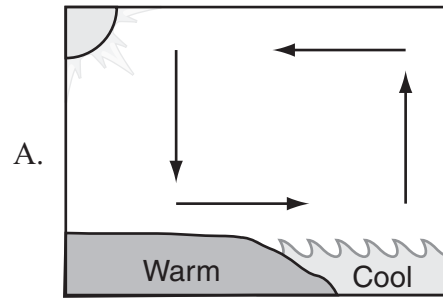
78. The graph below shows the average ozone concentration in spring from 1955 to 1995.



During which decade did the average ozone concentration dramatically decrease with the least fluctuation?

- A. 1955–1965
  - B. 1965–1975
  - C. 1975–1985
  - D. 1985–1995
79. Which statement explains why glass is a good electrical insulator?
- A. Glass reflects charges.
  - B. Glass refracts charges.
  - C. Charges can easily flow through glass.
  - D. Charges have difficulty flowing through glass.

80. Which diagram correctly shows how a convection current produces winds that impact the lake shore?



**Write your answer in the space provided for it in your Student Response Booklet.**

81. Mitosis (nuclear division in nonsex cells) is an important cell process. Describe **four** features or processes of mitosis.

# Acknowledgments

**Measured Progress and Montana’s Office of Public Instruction wish to acknowledge and credit the following authors and publishers for use of their work in the Montana Comprehensive Assessment System—2008.**

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